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ABSTRACT

Implementation of educational computing in schools is dependent upon teachers' attitudes toward computers as well as their expertise. Most inservice activities focus on increasing teacher expertise, while paying little attention to teachers' attitudes towards the technology. To investigate teachers' concerns about educational computing, two studies were conducted using the Concerns-Based Adoption Model (CBAM). Participants included 91 classroom teachers voluntarily enrolled in a microcomputer class. The first study identified teachers' concerns about educational computing and monitored changes in these concerns during an inservice activity. While concerns theory hypothesizes that the concerns of innovation users are developmental--beginning with self-oriented concerns, evolving through implementation-oriented concerns, and progressing to other-oriented concerns--this hypothesis was not supported. Results indicate that the nature of the inservice activity and/or the characteristics of the innovation may affect changes in concern. The second study evolved out of the first and examined teachers' concerns about educational computing by focusing on specific educational uses of the technology (e.g., computer assisted instruction, word processing, interactive video). The findings indicate that different uses of computer technology elicit different concerns about the technology. It is suggested that inservice designers should recognize educational computing as an "innovation bundle," and concentrate on specific applications of the whole technology rather than addressing the total package. A list of references is provided. (JB)

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Educational Computing Inservice Design:

Implications from Teachers' Concerns Research

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Educational Computing Inservice Design:

Implications from Teachers' Concerns Research

Abstract

This paper provides an overview of an ongoing research effort studying teachers' concerns about educational computing. Two studies are reported. The first study identified teachers' concerns about educational computing and monitored how these concerns changed during an inservice activity. Concerns theory hypothesizes that the concerns of innovation users are developmental, beginning with self-oriented concerns, evolving through implementation-oriented concerns, and progressing to other-oriented concerns. The research findings were not consistent with the hypothesis, suggesting that the nature of the inservice and/or the characteristics of the innovation (i.e., educational computing) may affect changes in concern. The second study evolved out of the first and examined teachers' concerns about educational computing by focusing on specific educational uses of the technology (e.g., CAI, word processing, interactive video). The research findings indicated that different uses of computer technology elicit different concerns about the technology. The findings suggest that inservice designers dealing with educational computing should recognize educational computing as an "innovation bundle" and concentrate on specific applications of the technology, rather than addressing the technology whole-cloth.

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Educational Computing Inservice Design: Implications from Teachers' Concerns Research

Before teachers can take full advantage of computer technology, they must modify their instructional practices to accommodate the technology. Stevens (1980) stated that two major factors affect implementation of educational computing: teachers' expertise with computers and teachers' attitudes toward computers. Most inservice attempts focus on increasing teachers' computer expertise while paying little attention to teachers' attitudes toward the technology. Such an inservice emphasis is understandable given: 1) the growing amount of information about educational computing; and, 2) the limited amount of information regarding teachers' attitudes toward educational computing. Thus, a research base focusing on teachers' attitudional responses to computer technology needs to be established. This paper reports on two studies of teachers' concerns about educational computing. The paper reports the patterns of concerns teachers had about educational computing, describes how these patterns changed during an inservice effort, and examines the relationship between teachers' attitudes toward educational computing and specific applications of computer technology.

Literature Review

Computer-related inservice design is in its infancy; the professional literature frequently fails to provide either evidence of effectiveness or a theoretical framework to support the design suggested. This is particularly evident in the affective dimension of inservice design where little attention has been given to the adult learner in a change endeavor involving computer technology.

The awareness that inservice usually involves adult learners is an important, although frequently ignored, dimension of inservice design (Orlich, 1983). Knowles (1970) described adult learners as human beings who draw heavily upon past experiences, are more problem-centered than content centered with immediacy of application a high priority, and are highly self-directed. These learner characteristics are manifested in inservice programs as learner concerns.

Teachers, as adult learners, bring a variety of past experiences to a learning situation. Podemski (1981) observed that many teachers have had limited experience with educational computing and have, instead, relied upon, and made a commitment to "non-computerized" materials and teaching techniques. Teachers having limited experiences with computing may reflect concerns related to simply gaining awareness about educational computing.

The problem-centered characteristic of the adult learner is expressed, in the area of educational computing, as a strong concern for more effectively meeting the needs of students (Stevens, 1982). Also, concerns regarding the effect of educational computing on the day-to-day management of the new technology may be more significant to some teachers than the acquisition of technical expertise (Jarchow & Hunter, 1983). If an inservice program does not address the concerns that are relevant to the teachers, then some teachers, as adult learners, may redirect their attention away from the inservice and perhaps away from educational computing.

Understanding how adult learners respond to innovations and how responses change as a result of inservice efforts has been systematically researched using the Concerns-Based Adoption Model (CBAM) (Hall, Wallace & Dossett, 1973). The CBAM suggests that inservice efforts may be less than optimally successful because inservice designers fail to consider where teachers are in the process of acquiring new attitudes, understandings, and skills relative to the given innovation (Loucks & Hall, 1977). The model suggests that when adult learners engage in a new learning endeavor, they pass through predictable stages of concern. These stages reflect a developmental movement from a lack of awareness concerning an innovation to a general seeking of information, to personal, management, and consequence concerns, and finally to concerns regarding collaboration and further innovation. Brief definitions of the stages of concern are shown in the Appendix.

While the CBAM is generally accepted in the inservice design and change process literature, the model has received limited use in designing or researching educational computing inservice efforts. Bartel (1984) and Wedman and Strathe (1984) used the stages of concern framework to design faculty development programs, but did not formally assess concerns. Wedman and Heller (1984) described teachers' concerns before they entered an inservice effort but did not investigate how these concerns changed during an inservice effort. Thus, the purpose of Study #1 was to test the changes in concerns as hypothesized by the CBAM. Specifically, Study #1 assessed teachers' concerns and described the effect of an inservice effort on their concerns about educational computing. Study #2 evolved out of Study #1 in an effort to understand better the unpredicted results of the earlier study.

Methods & Findings: Study #1

The participants in Study #1 were classroom teachers who had voluntarily enrolled in a university-offered course, "Microcomputers in Education," for which they paid their own tuition. Sixty-five were females (71%);

twenty-six were males (29%). Forty-four taught elementary grades (48%); seventeen taught middle/junior high grades (19%); twenty-six taught high school (29%); four taught grades K-12 (4%). The teachers varied in years of teaching experience (one to forty-four years) and amount of computer experience (novice to computer science instructors). Both pre and post data were collected from 91 of the 104 participating teachers.

The course was offered at six different sites across a central midwestern state during the fall of 1982 thru the Spring of 1984. Each offering was in response to requests from administrators and teachers for computer-related inservice. The course consisted of 30 hours of classroom instruction and several out-of-class assignments. The actual duration of the inservice course varied from two weeks (five hours per day, three days per week) to eight weeks (three and 3/4 hours per day, one day per week). The course placed emphasis on transferring course content to the teachers' own practices. The same content was used in each course and included such topics as microcomputer operation, elementary programing, software selection, evaluation, and utilization, and simple authoring systems.

The Stages of Concern Questionnaire (Hall & Rutherford, 1976) was used to measure teacher's attitudes toward educational computing. The items on the questionnaire represent the seven stages of concern; five items comprise the scale for each stage. Estimates of internal consistency (alpha coefficients) for stages range from .64 to .83. Hall and Rutherford (1976, pp. 12-20) describe several studies which indicate the SoCQ is a valid measure of the hypothesized concerns.

The SoCQ was administered to all teachers enrolled in the six offerings of the course. The preassessment was conducted during the first class meeting prior to any discussion of the course or its content. The subjects were told that the results of the questionnaire would be used to evaluate the effectiveness of the course.

The SoCQ was scored using the SoCQ Quick Scoring Device (Hall & Rutherford, 1976). The Quick Scoring Device converts raw scores to percentile scores for each stage of concern. A higher percentile score is associated with greater concern intensity. Pre and post data were then prepared (compiled and averaged) for comparison of teachers' concerns for each site and for the entire group.

For interpreting SoCQ results, Hall and Rutherford (1975) suggest that "...due to the nature of the questions being asked, identification of trends and patterns in the data seems more valid than conducting a series of tests of statistical significance." (p. 8) Following this suggestion, each teacher's pre and post SoCQ percentile

scores were graphed thus forming "concerns profiles." The compiled data for each site and the entire group were also graphically represented.

Examination of the preassessment profiles revealed that for most teachers entering the inservice course, lower level, more self-oriented concerns, were typically most intense (see Figure 1). These informational and personal concerns reflected interest in the general characteristics of the innovation and the relationship between one's role and the demands of change. In addition, however, it was observed that approximately 1/3 of the participants displayed a "two-humped" profile with high intensity concerns in both information and collaboration (See Figure 2). This profile was reflective primarily of those individuals who had considerable computer experience prior to the inservice effort.

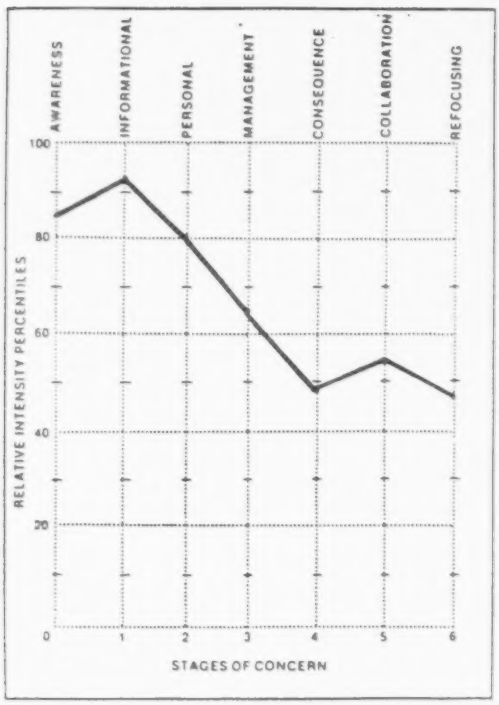

Figure 1.

Preassessment concerns profile, entire group, Study #1.

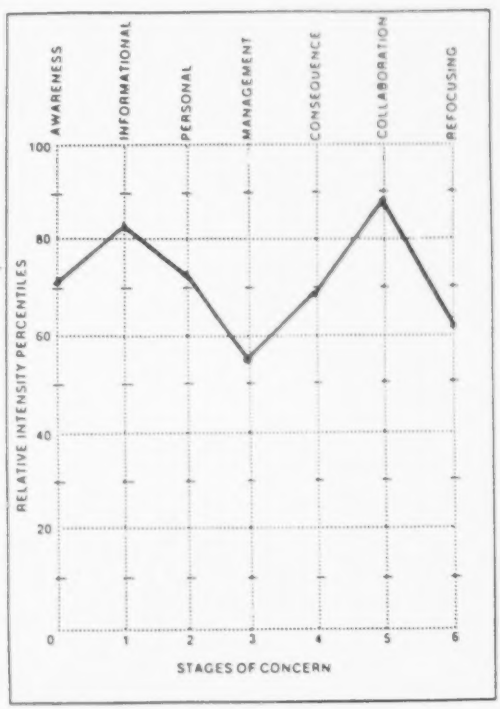

Figure 2.

Preassessment concerns profile, "two-humped," Study #1.

Analysis of the postassessment profiles (see Figure 3) revealed several unexpected patterns. While the work of Loucks and Hall (1977) has suggested a developmental progression in concerns changes, intermediate concerns (i.e., management) typically remained lower in intensity. In addition, it was noted that the intensities of higher level concerns (consequence, collaboration, and refocusing) increased although lower level concerns, evident in the preassessment profiles, did not change markedly, somewhat in contrast to the progression suggested by the CBAM model. It should also be noted that the postassessment profiles resembled the "two humped" profile commonly found among the experienced individuals.

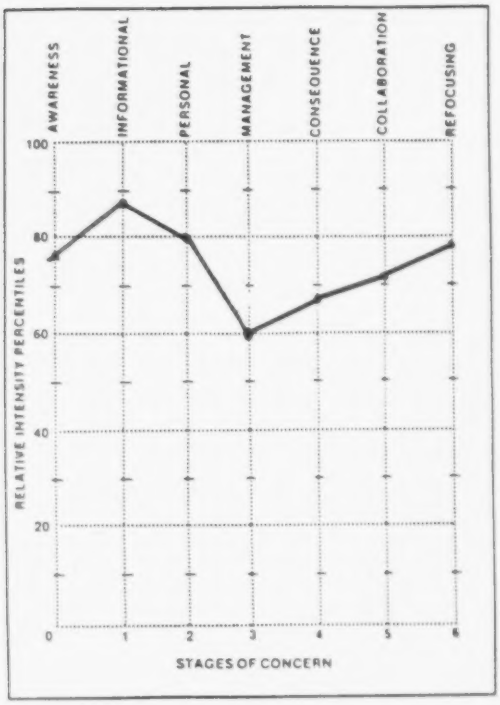

Figure 3.

Postassessment concerns profile, entire group, Study #1.

Discussion: Study #1

The preassessment profiles in Study #1 suggest that inservice providers must be cognizant of the heterogenity of teachers' concerns about educational computing. Inservice experiences for many individuals need to address self-oriented concerns while experiences for other individuals need to address both self-oriented and other-oriented concerns.

The surprisingly low intensity of implementation-oriented concerns at both the pre and postassessment points raises several questions. The low intensity may be suggestive of the nature of the inservice effort itself which encouraged but did not require teachers to actually

implement educational computing activities in their classroom. Or, perhaps implementation-related concerns did not become intense because the teachers were not given sufficient time to fully implement the innovation and manifest implementation-related problems and the associated concerns. It may also be posited that, while teachers became comfortable with the elementary aspects of educational computing (e.g., system operation, use of drill and practice software), they also became aware of more advanced aspects of the technology (e.g., word processing, interfacing with other devices). Thus, the postassessment profiles may be actually depicting concerns about more than one aspect of educational computing. This explanation is consistent with the multi-faceted nature of educational computing and served as the impetus for Study #2 which examined how teachers' concerns vary when different aspects of educational computing are considered. It was predicted that, if teachers' concerns do vary, then more familiar applications will be associated with more advanced stages of concern.

Methods & Findings: Study #2

In Study #2, the SoCQ was used to assess teachers' concerns about different aspects of educational computing. Five elementary schools (E-1...E-5), one middle school (M S), and one high school (H S) from a midwestern school district volunteered to participate in the study. Teachers at the schools completed one of four randomly selected versions of the SoCQ, each version focusing on a different application, specifically, computer assisted instruction (CAI), computer managed instruction (CMI), interactive video (IV), and word processing (WP). The teachers were also asked to complete an open-ended concerns question for the particular application. Table 1 lists the schools involved in Study #2 and indicates the number of teachers completing each version of the SoCQ. Concerns profiles were constructed for individual teachers and groups of teachers responding to the same application of educational computing.

Table 1. SoCQ Questionnaire Version by Schools

	<---------- Schools ---------->							
SoCQ	E-1	E-2	E-3	E-4	E-5	M S	H S	Totals
CAI	4	4	5	5	3	8	12	41
CMI	5	4	5	5	3	6	14	42
IV	4	4	6	4	3	7	10	38
WP	6	4	6	6	2	8	16	46
Totals	17	16	22	20	11	29	52	167

Initial examination of the four sets of group profiles (by application) revealed that when teachers consider different aspects of educational computing, different types of concerns are NOT evident (see Figures 4a-d). This finding appears to suggest that teachers' concerns about educational computing are essentially the same, regardless to the particular application being considered. Closer examination of the concerns data revealed, however, that such is not the case.

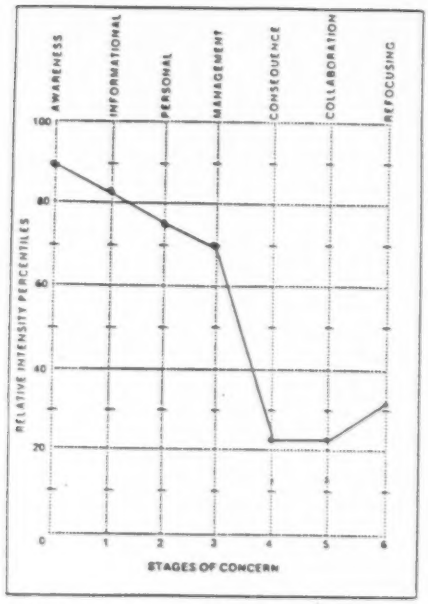

Figure 4a. CAI concerns

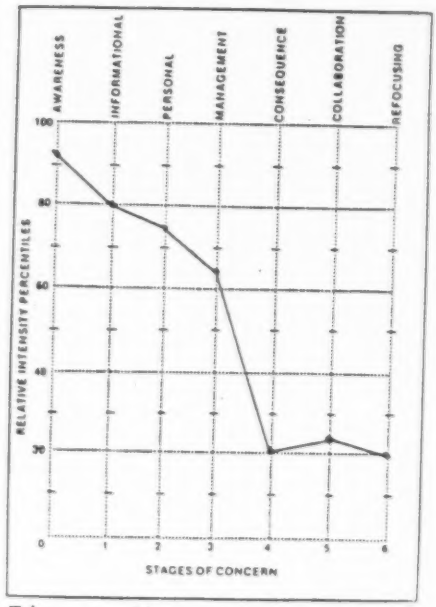

Figure 4b. CMI concerns

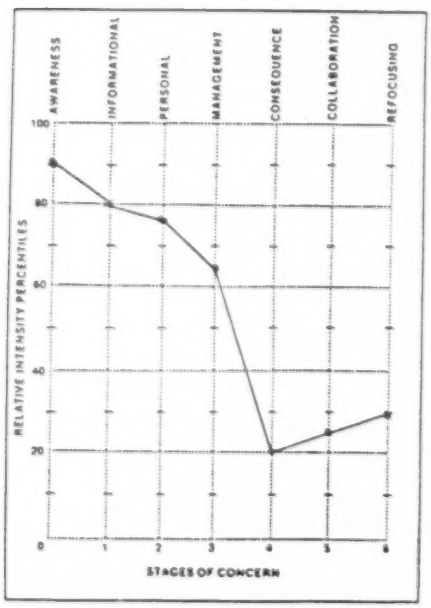

Figure 4c. IV concerns

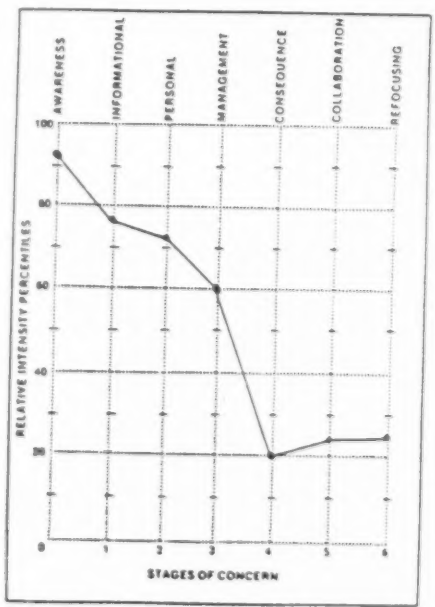

Figure 4d. WP concerns

When the individual profiles are examined, a different picture becomes evident. By examining the individual profiles, and noting which concern has the highest intensity, a simple matrix of concerns by applications can be created. (Note: In those cases where two concerns had the same intensity, the open-ended data was used to help classify the profile.) Such a matrix, shown in Table 2, can be used to identify, for a given application, the percentage of teachers having a particular concern as most intense. Three patterns are noteworthy. First, the percentage of teachers having intense awareness concerns was lower in CAI than in other applications. Second, the percentages were more widely distributed in CAI than in other applications. Finally, a large majority of concerns about interactive video were in the awareness stage.

Table 2. Concerns x Application Matrix

	Application			
Stage of Concern	CAI	CMI	IV	WP
Awareness	42%	60%	70%	59%
Information	35%	26%	23%	29%
Personal	15%	12%	7%	8%
Management	8%	2%	--	4%
Consequences	--	--	--	--
Collaboration	--	--	--	--
Refocusing	--	--	--	--

Note: Cell entries indicate, for a given application, the percentage of teachers whose concerns were most intense for a particular stage of concern.

Discussion: Study #2

The variation in teachers' concerns about different educational computing applications was not evident in the composite group profiles. Yet, when the concerns data was considered on an individual basis, important differences became evident. Teachers' concerns about educational computing do vary, depending on which application is being considered. This finding seems to support the notion that educational computing is an "innovation bundle," that is, a collection of several specific innovations each of which elicit potentially different concerns. The finding is also consistent with the results of Study #1 in that the two-humped profiles may have actually been representations

of concerns about more than one innovation. Study #2 also suggests that inservice designers, evaluators, and researchers need to focus on specific aspects of educational computing rather than on the entire innovation.

Conclusion

This paper reported on two studies examining teachers' concerns about educational computing. Collectively, the studies suggest that educational computing is an innovation bundle rather than a single, unitary innovation. If educational computing is an innovation bundle, then the problem for inservice designers is, in part, one of "unbundling" the innovation. Care should be taken, however, to not mistake the end result of such an analysis as a blueprint for designing inservice. Some instructional design theories, for example, Reigeluth's (1979) elaboration theory, suggest that instruction should be organized in a general to specific structure. Educational computing content readily lends itself to such a structure. An inservice program designed to expose teachers to several aspects of educational computing could serve as the "epitome." Later inservice efforts would then concentrate on more specific aspects of educational computing. As the inservice begins to focus on more narrowly defined applications, the inservice designers should then begin to collect and use concerns-related data as part of their audience analysis.

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Appendix

Definitions of Stages of Concern About the Innovation.

Stage	Title	Definition
0	Awareness	Unaware of or unconcerned about the innovation.
1	Information	Concerned about the general characteristics of the innovation.
2	Personal	Concerned about the relationship between one's role and the demands of the innovation.
3	Management	Concerned about the management and organization of the innovation.
4	Consequences	Concerned about the impact of the innovation on student outcomes.
5	Collaboration	Concerned about working with others using the innovation.
6	Refocusing	Concerned about something better than the innovation.